POWER FORECAST 2012

WILLISTON BASIN
OIL AND GAS RELATED
ELECTRICAL LOAD GROWTH FORECAST

MONTANA SUMMARY

KLJ

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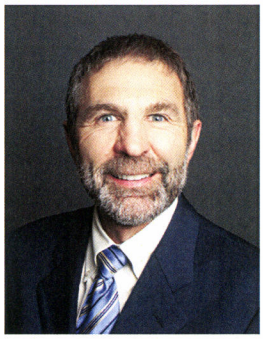
Mike Wamboldt, PE
Project Manager
701 355 8711
mike.wamboldt@kljeng.com



Niles Hushka, PE
CEO
701 355 8411
niles.hushka@kljeng.com

1. Williston Basin Oil and Gas Related Electrical Load Growth Forecast

The North Dakota Transmission Authority (NDTA), which facilitates the development of transmission infrastructure in North Dakota, requested KLJ, an employee-owned firm that delivers multi-disciplinary planning and engineering-based solutions, to develop the *Williston Basin Oil and Gas Related Electrical Load Growth Forecast* (*PF 12*) to assist in electrical infrastructure assessment and planning. The findings contained in the *PF 12* report forecasts electrical load growth and demand related to oil and gas development in the Williston Basin and Bakken Formation (Figure 1) for the next 20 years (2012 to 2032). The study area spans three regions across North Dakota, South Dakota and Montana (Figure 2).

Information in the *PF 12* report related specifically to the 12 key oil-producing counties in the eastern regions of Montana indicates that over the next 20 years, electrical demand is expected to nearly double. This estimated growth is primarily due to expansion of oil and gas related infrastructure, in addition to a correlating increase of workforce population in the oilfield services industry.

Figure 1: The Williston Basin and Bakken Formation
Source: KLJ

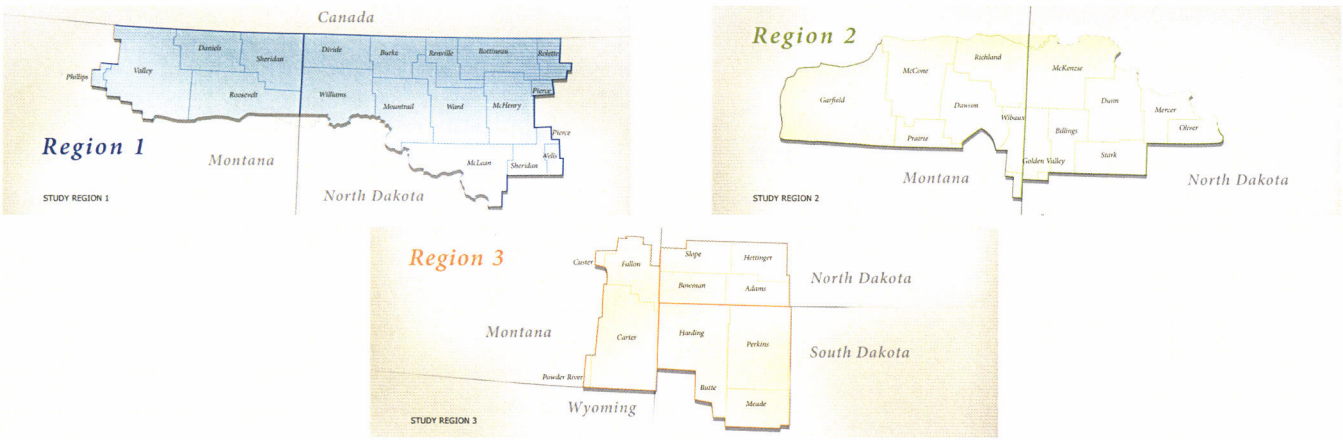


Figure 2: The Three Study Regions in *PF 12*
Source: North Dakota Transmission Authority

2. PF 12 Methodology

The methodology of developing the *PF 12* report consists of a modeling process (Figure 3), which includes information relevant to development in the Williston Basin shale formations. Assumptions created from industry stakeholder interviews and research were validated through industry experts, government officials and the NDTA. Following validation, the process of electrical load growth modeling began through a GIS-based modeling process that factored key information from employment, population, housing, future infrastructure needs and existing electrical power loads.

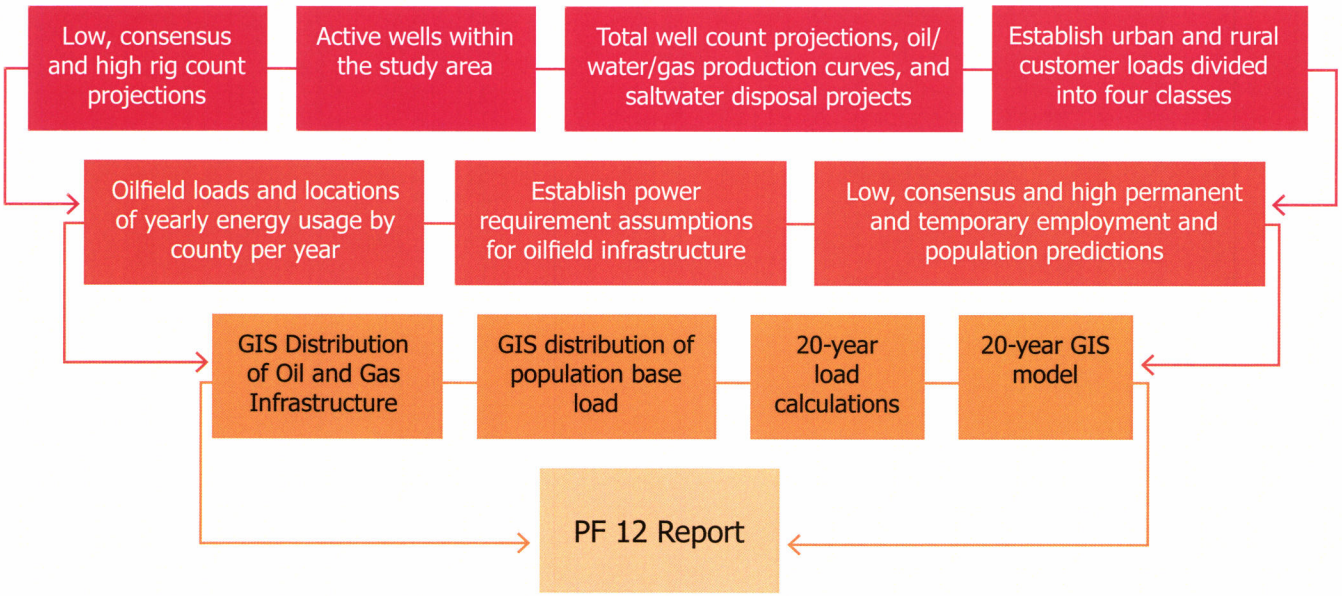


Figure 3: Modeling Process Methodology
Source: KLJ

2.1. *Employment*

The 20-year oilfield development projections were used to develop future employment estimates, which, in turn, established the *PF 12* population growth metrics that outlined year-by-year housing demand. These factors are critical components of the *PF 12* model and of extreme relevance to the Montana portion of the study area.

Total employment is divided into two categories: temporary workforce and permanent workforce. Temporary workforce is regarded as workers who are likely residents of other states, and will be employed at a single location until their specific job is complete and then move to a different job site. Permanent workforce is defined as employees who are established residents of Montana.

Results indicate temporary and permanent employment in Montana's petroleum-sector within the study area will steadily climb over the next 15 years until approximately 2026, when development begins to decrease, resulting in a decline and leveling off of temporary employment. As the industry pulls back on drilling and hydraulic fracturing activities and gathering system build-out, it removes temporary jobs. Further, well operations are expected to increase in efficiency, and require less onsite maintenance and service labor than current requirements.

2.2. *Population growth*

Population forecasts of the 12 eastern Montana counties were calculated from the estimates of employment demand. These population forecasts indicate a 12 percent increase over the next 20 years for these counties in eastern Montana. The sharpest increase of permanent population growth in the oil-producing counties is expected between 2012 and 2022, in response to increasing demand for oilfield services.

Temporary population in the 12 counties is forecasted to reach a peak within five years, then gradually decrease through 2026, when the remaining temporary population begins to sharply decline. The decline is due to the expectation that the temporary workforce will be leaving Montana as the majority of the oilfield infrastructure construction nears completion.

2.3. *Housing demand*

Petroleum-sector housing requirements in Montana has steadily outstripped supply, leaving many permanent and temporary workers either without housing or in housing that requires traveling a considerable distance to work sites. Population projections indicate that housing in the 12-county region will continue to remain just as constrained for nearly 15 more years, as new workers entering the area continue to exhaust the supply of existing homes and apartments.

The greatest demand for housing in Montana is temporary housing, where employment projections indicate large levels will be needed for more than a decade. Figure 4 indicates after approximately 2026, temporary and permanent housing demand will decline and level off throughout the remainder of the study period.

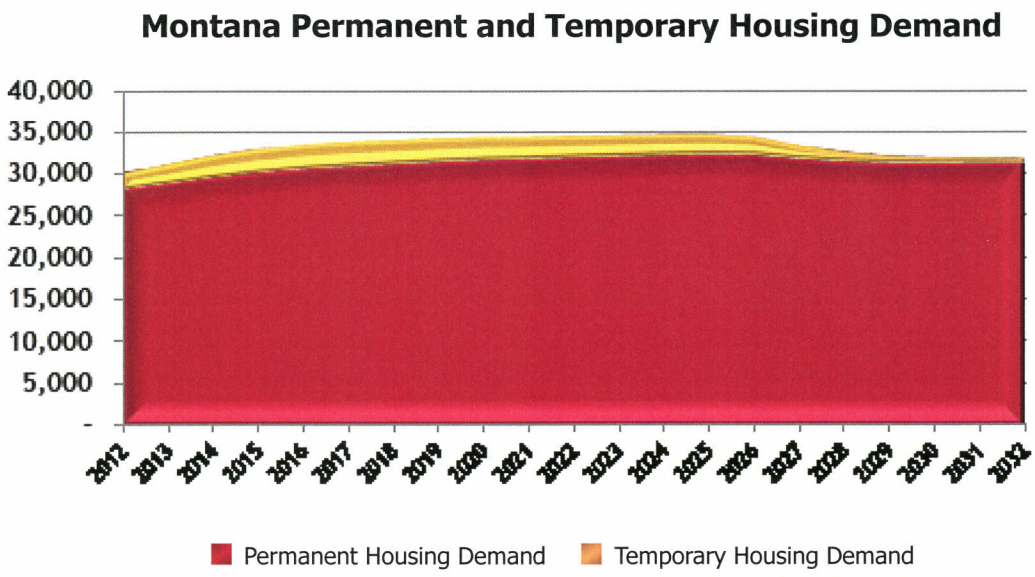


Figure 4: Montana Permanent and Temporary Housing Demand
Source: North Dakota State University

3. PF 12 Results

With all factors combined into the model, electrical demand can be determined and modeled over a 20-year period. This information, when broken down by megawatt (MW) demand by county in Montana, serves as an extremely useful planning tool (Table 1).

Montana Forecasted Electric Load Demand					
	Demand (MW)				
County	2012	2017	2022	2027	2032
Richland	61	111	142	169	190
Roosevelt	35	57	77	95	109
Sheridan	17	43	68	90	107
Fallon	23	50	52	53	54
Dawson	23	31	35	38	41
Valley	20	35	36	36	37
McCone	7	33	34	35	36
Carter	3	9	9	10	10
Garfield	6	7	7	8	9
Wibaux	4	6	6	7	7
Daniels	4	5	5	6	6
Prairie	1	1	1	1	1
TOTALS	**204**	**386**	**473**	**547**	**608**

Table 1: Montana Forecasted Electric Load Demand
Source: KLJ

Current 2012 estimated demand for the 12 Montana counties is 204 MW. This capacity needs to be available to power oil wells, homes and large and small businesses. By 2032, electrical demand for the same 12 counties is forecasted to reach 608 MW.

The number of wells alone significantly impacts the electrical demand. In addition, the infrastructure associated with the wells, which includes compressor stations, saltwater disposal sites, booster pumps and well pads, each has its own power requirements. Each well pad also needs electricity for the transfer unit, the vapor recovery unit, transfer pumps, the separator, lighting, heating and instrumentation.

Although the number of wells continues to rise over the 20-year study period, the rise starts to decelerate after 2022. During the five-year period between 2022 and 2027, an additional 1,111 wells are expected to be added. This compares with the 1,212 new wells between 2012 and 2017 and 1,207 additional wells between 2017 and 2022. The decline continues during the five years between 2027 and 2032, with only 942 new wells added (Figure 5).

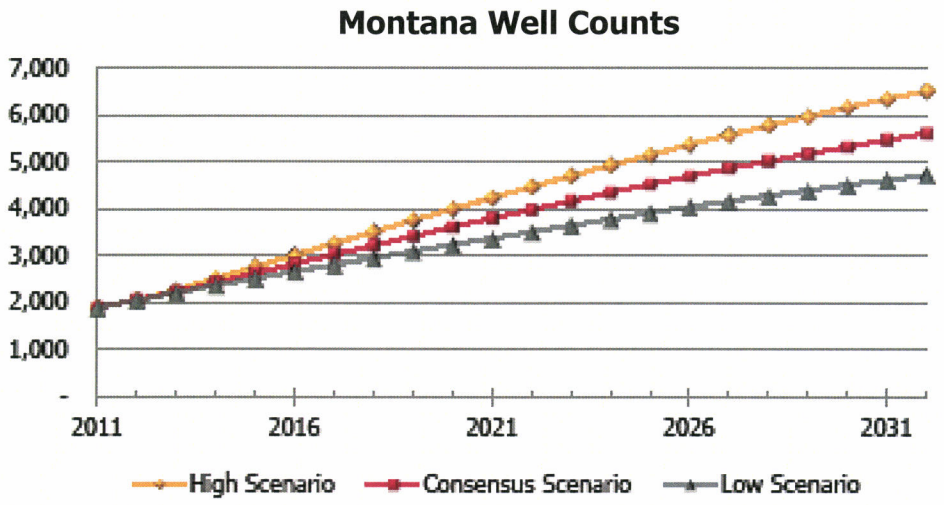


Figure 5: Montana Well Counts
Source: University of North Dakota

Rig efficiencies are expected to increase, eventually allowing newer rigs to drill 12 wells per year, by the end of the study period, versus the 10 wells per rig being drilled today. The study indicates rigs could drill as many as 16 holes per year on a multi-well pad, however, for purposes of this study, wells were kept to two wells per spacing unit in Montana. Rig efficiency will be limited by relocation time, maintenance, crew rotation and complexity.

Since 2009, rig counts in the 12 Montana counties of the study area have more than quadrupled, reaching more than 17 during the summer of 2012. This level of drilling activity is expected to continue for the next four years through the end of 2017. After 2017, rig counts are forecasted to steadily decrease throughout the next 15 years (Figure 6).

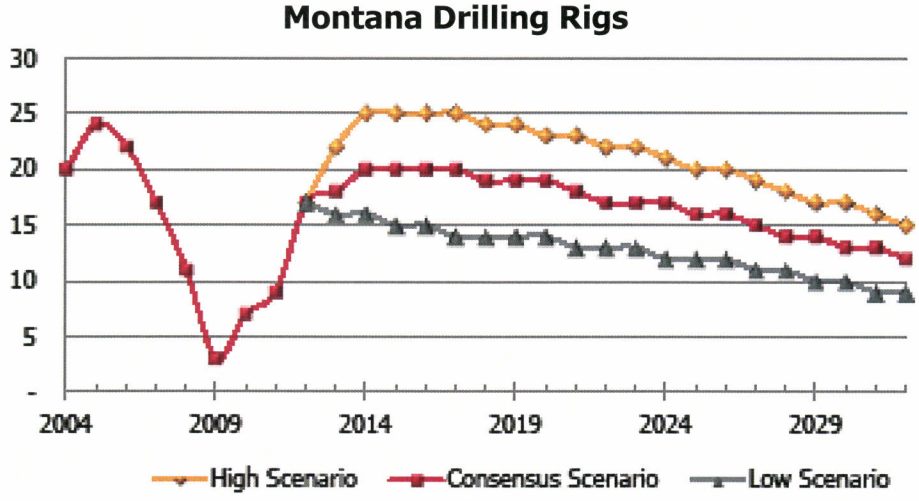


Figure 6: Montana Drilling Rigs
Source: University of North Dakota

Variability in the oil and gas industry will require an update to the *PF 12* model every 12 to 18 months to capture changes to development information and power loads. As new factors are identified, this method will serve to validate longevity of the oil and gas related growth in Montana. Although there is not enough conclusive data to forecast the location, timing, or magnitude of any of these factors with any reasonable certainty, these factors can add significant power demand and need to be monitored. Significant factors anticipated for future *PF 12* model updates include:

- **Enhanced oil recovery methods (EOR):** New recovery techniques, such as CO_2 injection, will become more commonplace and will add to the power demand load.
- **Wells per Spacing Unit (Montana)**: An increase beyond two wells per spacing unit correlates with an increase to power demand for the well pad and associated infrastructure.
- **Gas processing facilities:** In addition to processing plants already planned or in construction that have been included in the forecast model, up to two additional large gas processing facilities are expected to be built within the entire study area, between 2015 and 2019.
- **Production water treatment facilities:** If and when production water treatment facilities are developed, an appropriate demand load will be applied to the model.
- **Oil transmission pipelines:** There is an increasing possibility of up to two major oil transmission pipelines, with a capacity of at least 100,000 barrels of oil per day each being constructed between 2015 and 2017.

4. PF 12 Conclusions for Montana

Projected energy demand in Montana is depicted through the *PF 12* model (Figure 7), highlighting where substantial demand requirements will be located. By the end of the study period in 2032, the entire 43 counties within the full study region will require an additional 2,512 MW of electrical demand, related to oil and gas development to accommodate population growth, new ancillary business development and more than 30,000 additional wells. Montana specifically will require 404 MW of additional electrical demand.

Richland County can expect a 211 percent increase in electrical demand by 2032

Sheridan County can expect a 529 percent increase in electrical demand by 2032

The *PF 12* report validates and supports growth opportunities and significant investment needed by the state, as well as, public and private electric companies who often must substantiate investments to lenders and shareholders. The results of the *PF 12* report confirm many opportunities, current and future, for the state of Montana. The favorable economy in Montana has the opportunity to continue and prosper further as the forecasted electrical demand will require significant investments in electrical generation, transmission and distribution infrastructure to support the regional growth brought on by the oil and gas development.

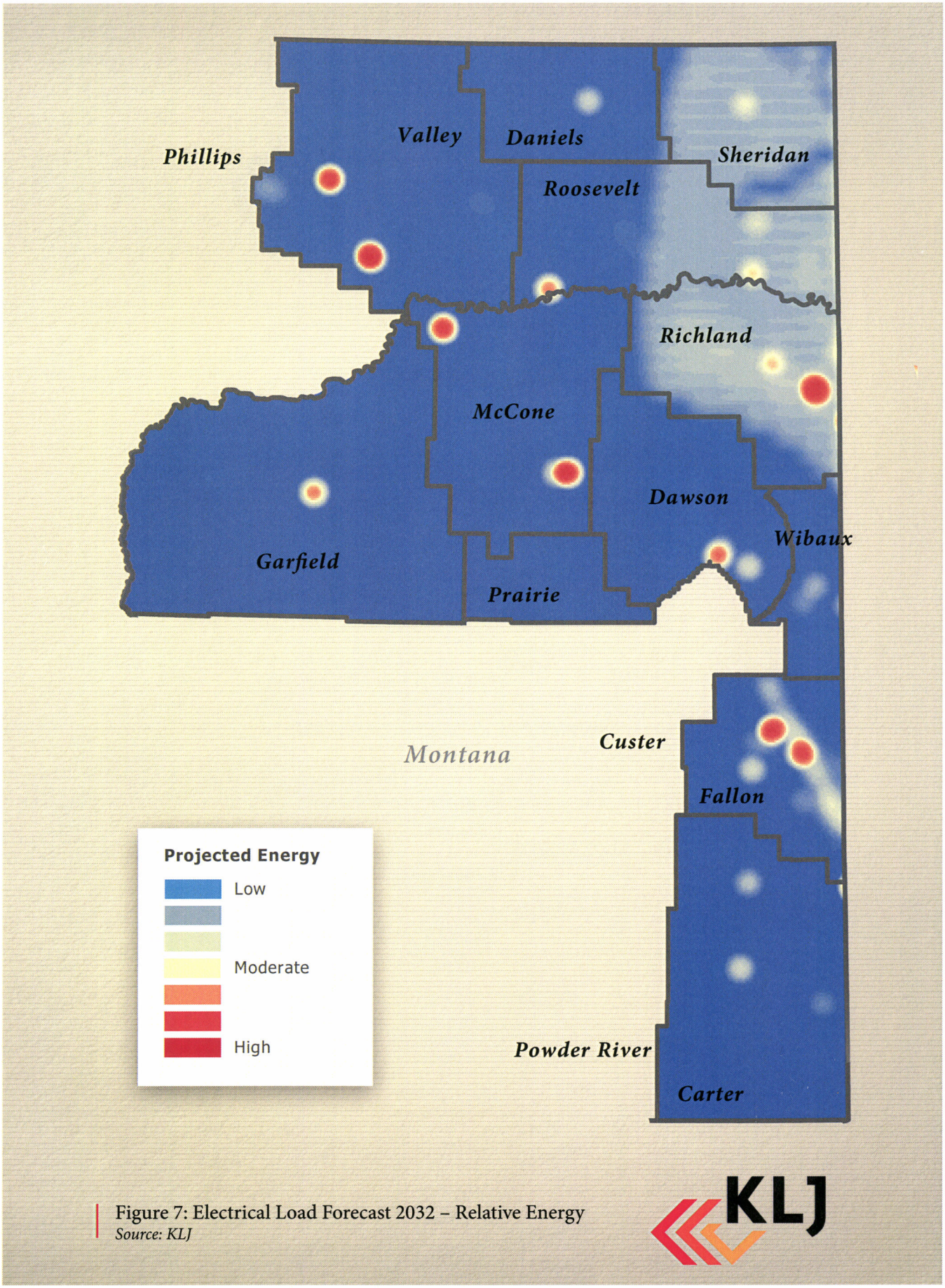


Figure 7: Electrical Load Forecast 2032 – Relative Energy
Source: KLJ

Acknowledgements

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North Dakota Pipeline Authority

Montana Board of Oil and Gas

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